

# MAPPING PADDY RICE IN ASIA

## A MULTI-SENSOR, TIME-SERIES APPROACH

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### Paddy Rice Mapping Relevance

Rice is the most important food crop in Asia and the mapping and monitoring of paddy rice fields is an important task in the context of food security, food trade policy and greenhouse gas emissions modelling. Two countries where rice is of special significance are China, the largest producer and importer of rice, and Vietnam, where rice exports contribute a fifth to the GDP. Rice production is facing increasing pressure due to population and economic growth while agricultural areas are confronted with urban encroachment and the limits of yield increase.

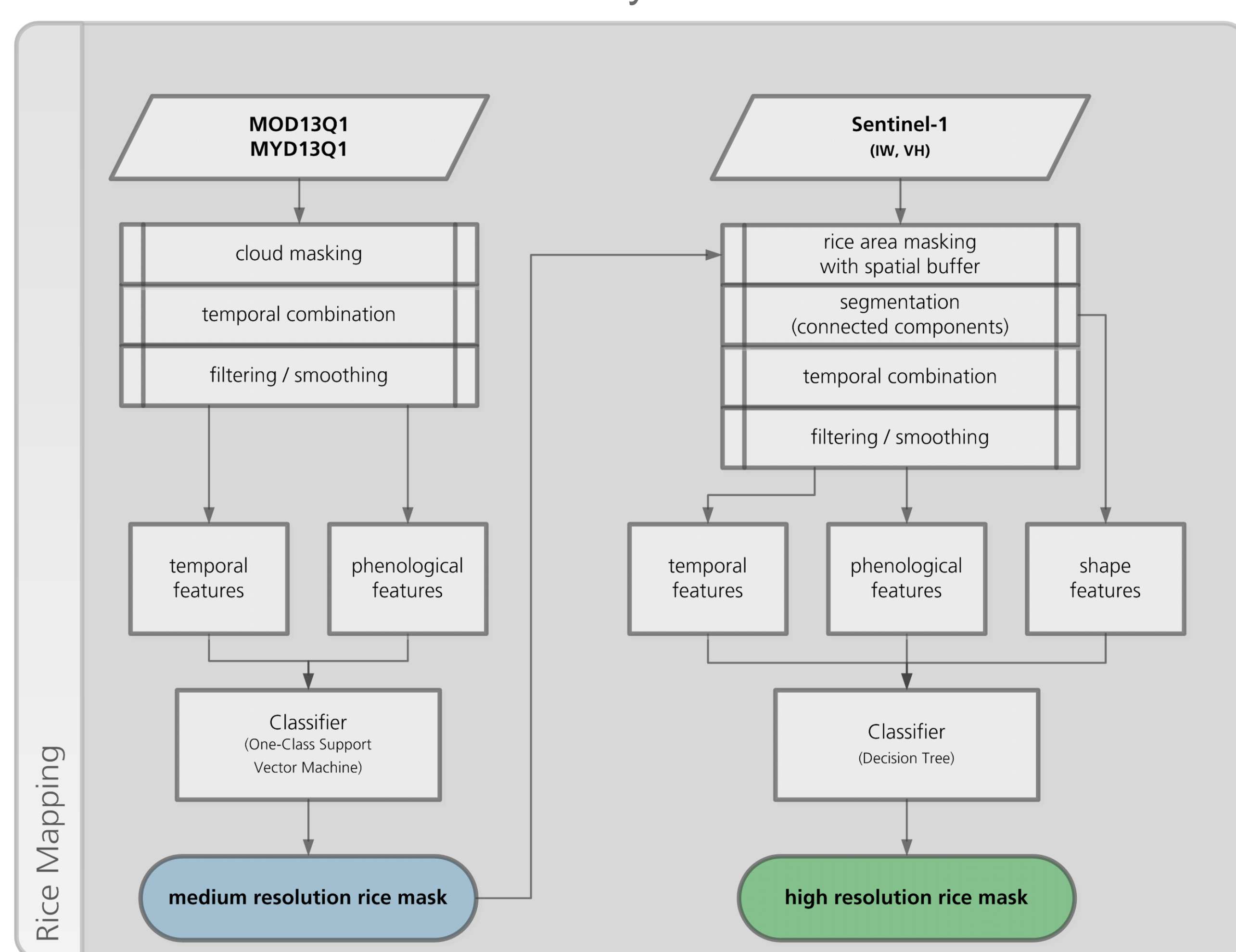


Fig. 1: Rice mapping with MODIS and Sentinel-1

### Data and Processing

The MODIS vegetation index products MOD13Q1 and MYD13Q1 are the basis for our medium resolution rice masks. Classification of rice areas is performed with a One-Class Support Vector Machine using temporal and phenological features derived from the filtered and smoothed MODIS time-series, as outlined in figure 1. The medium resolution (250 m) rice mask is used to decrease the amount of Sentinel-1 data prior to segmentation. The C-band SAR time-series is created from Interferometric Wide Swath Sentinel-1A data at VH polarization. Temporal, phenological and shape features are derived at the object level from the SAR time-series. Rice areas are then classified with a knowledge based decision tree to create a high resolution (10 m) paddy rice mask.

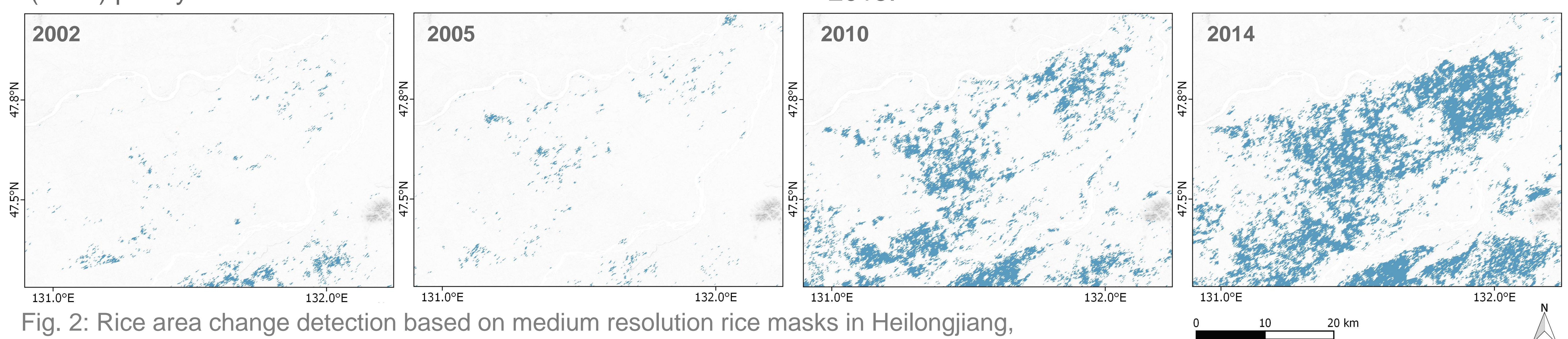


Fig. 2: Rice area change detection based on medium resolution rice masks in Heilongjiang, China.

[1] K. Clauss, H. Yan & C. Kuenzer. 2016. "Mapping Paddy Rice in China in 2002, 2005, 2010 and 2014 with MODIS Time Series". *Remote Sensing* 8, 434.

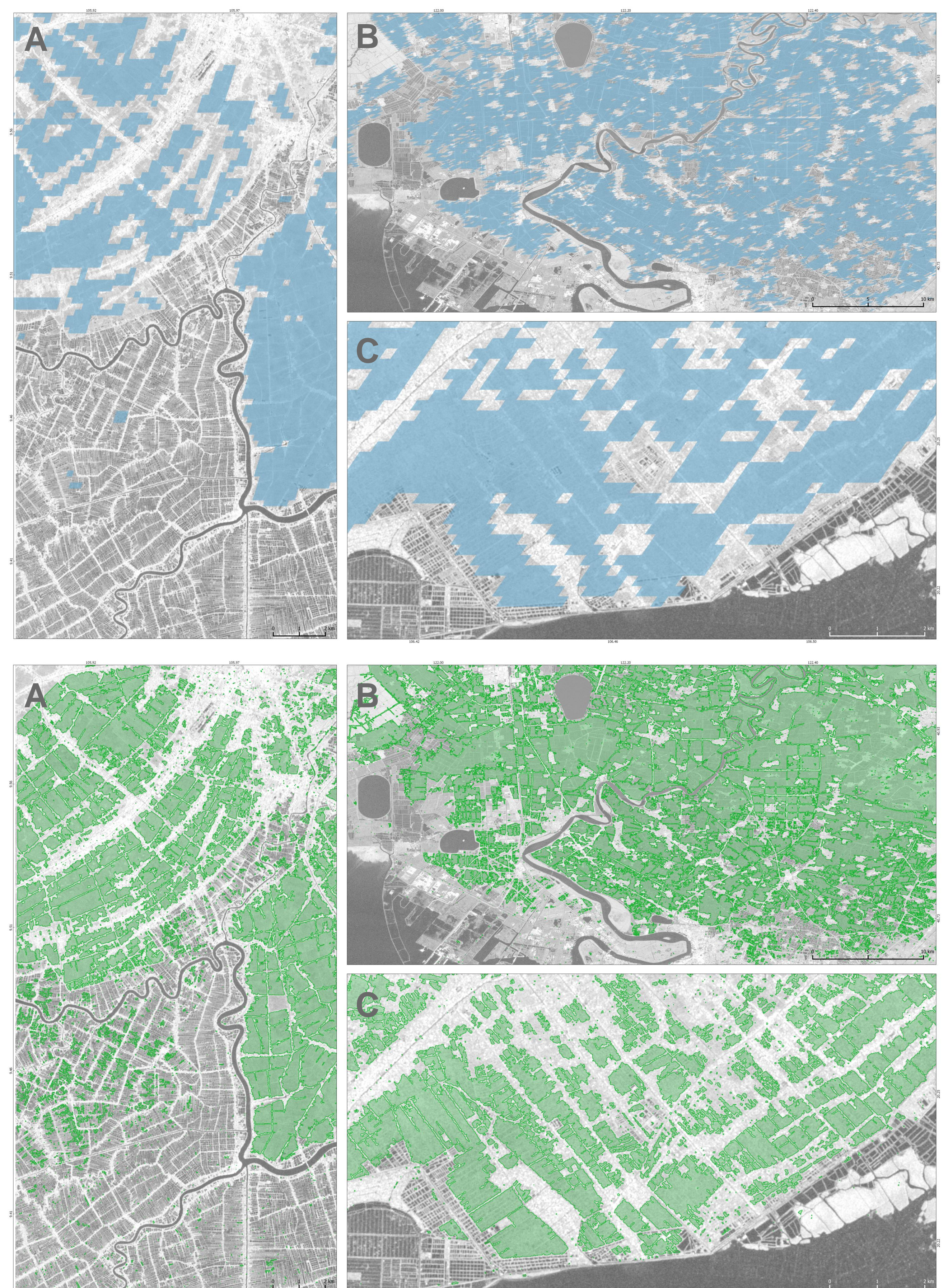


Fig. 3: Paddy rice masks 2015 derived from MODIS (blue) and Sentinel-1 (green) for Soc Trang, Vietnam (A), Liaodong Bay, China (B) and Giao Thuy, Vietnam (C).

### Results and Outlook

Medium resolution rice maps have been produced for Vietnam and China with high accuracies compared to reference data. Processing of the MODIS archive allowed rice area change detection from 2002-2014 in China [1]. Generation of high resolution rice masks for Vietnam and China is currently ongoing. Challenges are the validation due to a lack of reference data at this resolution as well as the imbalanced Sentinel-1 coverage, which ranges from 4 (Hainan, China) to 36 (Giao Thuy, Vietnam) acquisitions for 2015.